

STTH1002C

HIGH EFFICIENCY ULTRAFAST DIODE

MAIN PRODUCT CHARACTERISTICS

| I _{F(AV)} | Up to 2 x 8A |
|-----------------------|--------------|
| V _{RRM} | 200 V |
| Tj (max) | 175 °C |
| V _F (typ) | 0.78 V |
| t _{rr} (typ) | 20 ns |

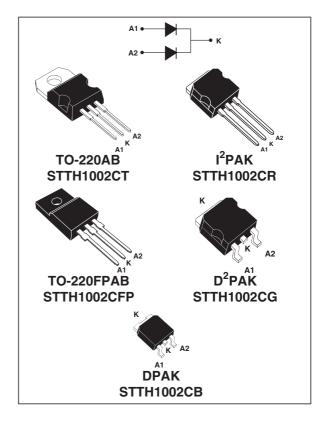
FEATURES AND BENEFITS

- Suited for SMPS
- Low losses
- Low forward and reverse recovery times
- Insulated package: TO-220FPAB
- High junction temperature
- Low leakage current

DESCRIPTION

Dual center tap rectifier suited for Switch Mode Power Supplies and High frequency DC to DC converters.

Packaged in DPAK, D²PAK, TO-220AB, TO220-FPAB and I²PAK, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications.



ABSOLUTE RATINGS (limiting values, per diode)

| Symbol | | Parameter | | | Value | Unit |
|---------------------|--|---------------------------------|-----------------------------|----------------------|-------|------|
| V _{RRM} | Repetitive peak reverse | Repetitive peak reverse voltage | | | | V |
| I _{F(RMS)} | RMS forward current | TO-220AB / TO-220 | FPAB / I ² PAK / | D ² PAK / | 20 | Α |
| | | DPAK | | | 10 | |
| I _{F(AV)} | Average forward | TO-220AB / I ² PAK | Tc = 155°C | Per diode | 5 | Α |
| | current $\delta = 0.5$ | /D ² PAK/DPAK | Tc = 150°C | Per device | 10 | |
| | | | Tc = 135°C | Per diode | 8 | |
| | | | Tc = 125°C | Per device | 16 | |
| | | TO-220FPAB | Tc = 140°C | Per diode | 5 | |
| | | | Tc = 120°C | Per device | 10 | |
| | | | Tc = 110°C | Per diode | 8 | |
| | | | Tc = 75°C | Per device | 16 | |
| I _{FSM} | Surge non repetitive forward current tp = 10 ms Sinusoidal | | | | | Α |
| T _{stg} | Storage temperature range | | | | | °C |
| Tj | Maximum operating jun | ction temperature | | | 175 | °C |

March 2004 - Ed: 4

STTH1002C

THERMAL PARAMETERS

| Symbol | | Parameter | | Maximum | Unit |
|-----------------------|------------------|---|------------|---------|------|
| R _{th (j-c)} | Junction to case | TO-220AB / I ² PAK / D ² PAK | Per diode | 4.0 | °C/W |
| | | / DPAK | Per device | 2.5 | |
| | | TO-220FPAB | Per diode | 6.5 | |
| | | | Per device | 5 | |
| R _{th (j-c)} | Coupling | TO-220AB / I ² PAK / D ² PAK / DPAK | | 1.0 | °C/W |
| | | TO-220FPAB | | 3.5 | |

When the diodes 1 and 2 are used simultaneously: Δ Tj (diode1) = P(diode1) x R_{th(j-c)} (per diode) + P(diode2) x R_{th(c)}

STATIC ELECTRICAL CHARACTERISTICS (per diode)

| Symbol | Parameter | Tests conditions | | Min. | Тур. | Max. | Unit |
|-------------------|----------------------|------------------|-----------------------|------|------|------|------|
| I _R * | Reverse leakage | Tj = 25°C | $V_R = V_{RRM}$ | | | 5 | μΑ |
| | current | Tj = 125°C | | | 3 | 40 | |
| V _F ** | Forward voltage drop | Tj = 25°C | I _F = 5 A | | | 1.1 | V |
| | | Tj = 25°C | I _F = 10 A | | | 1.25 | |
| | | Tj = 150°C | I _F = 5 A | | 0.78 | 0.89 | |
| | | Tj = 150°C | I _F = 10 A | | | 1.05 | |

To evaluate the maximum conduction losses use the following equation : P = 0.73 x $I_{F(AV)}$ + 0.032 $I_{F}^{\,2}(\mbox{RMS})$

DYNAMIC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Tests conditions | | Min. | Тур. | Max. | Unit |
|-----------------|--------------------------|------------------|--|------|------|------|------|
| t _{rr} | Reverse recovery time | Tj = 25°C | $I_F = 1 \text{ A } V_R = 30V$ $dI_F/dt = 100 \text{ A/}\mu\text{s}$ | | 20 | 25 | ns |
| I _{RM} | Reverse recovery current | Tj = 125°C | $I_F = 5 \text{ A } V_R = 160V$ $dI_F/dt = 200 \text{ A/}\mu\text{s}$ | | 5.9 | 7.6 | А |
| t _{fr} | Forward recovery time | Tj = 25°C | $I_F = 5 \text{ A} dI_F/dt = 100 \text{ A/}\mu\text{s}$ $V_{FR} = 1.1 \text{ x V}_F\text{max}$ | | | 110 | ns |
| V _{FP} | Forward recovery voltage | Tj = 25°C | I _F = 5 A dI _F /dt = 100 A/μs | | 2.4 | | V |

Fig. 1: Peak current versus duty cycle (per diode).

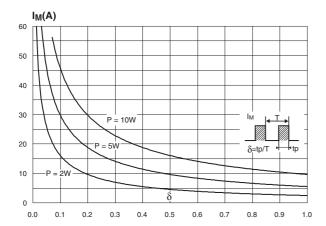


Fig. 2-2: Forward voltage drop versus forward current (maximum values, per diode).

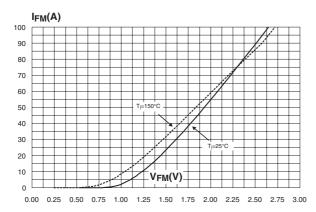


Fig. 3-2: Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB).

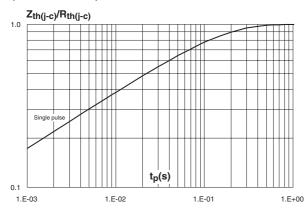


Fig. 2-1: Forward voltage drop versus forward current (typical values, per diode).

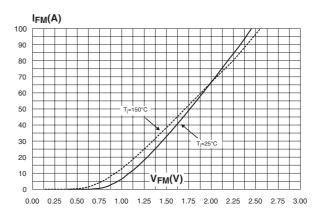


Fig. 3-1: Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB, I²PAK, D²PAK, DPAK).

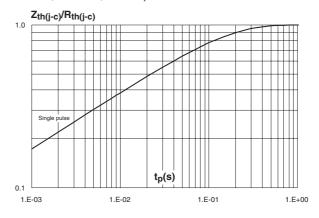
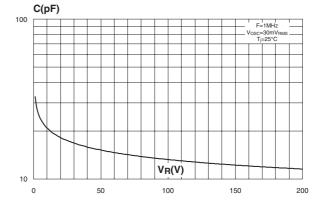


Fig. 4: Junction capacitance versus reverse voltage applied (typical values, per diode).



577

Fig. 5: Reverse recovery charges versus dl_F/dt (typical values, per diode).

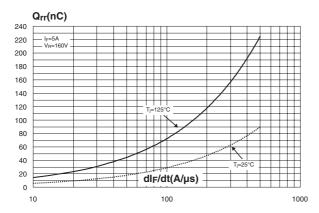


Fig. 6: Reverse recovery time versus dI_F/dt (typical values, per diode).

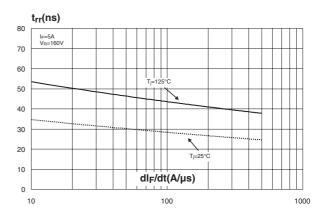


Fig. 7: Peak reverse recovery current versus dl_F/dt (typical values, per diode).

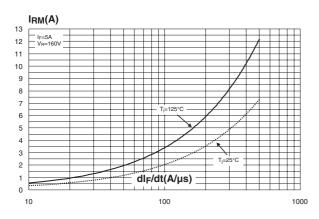


Fig. 8: Dynamic parameters versus junction temperature.

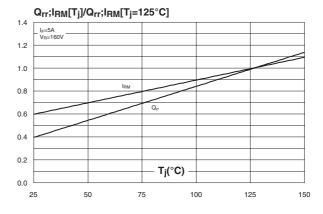


Fig. 9-1: Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, e_{CU}: 35μm) for D²PAK.

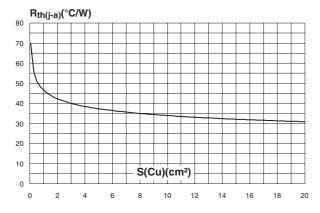
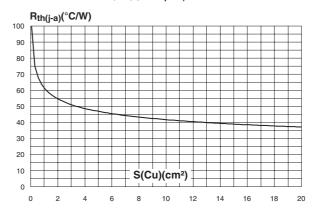


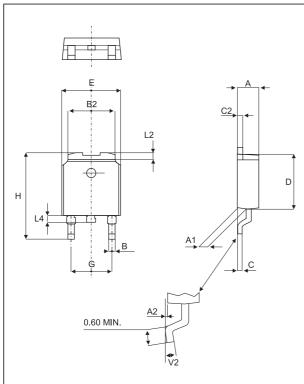
Fig. 9-2: Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, e_{CU}: 35μm) for DPAK.



4/8

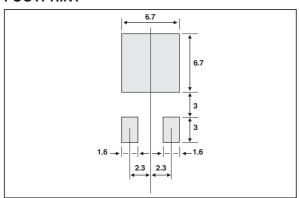
| Ordering code | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|-------------|--------------------|--------|----------|---------------|
| STTH1002CB | STTH1002CB | DPAK | 0.3 g | 75 | Tube |
| STTH1002CB-TR | STTH1002CB | DPAK | 0.3 g | 2500 | Tape & reel |
| STTH1002CT | STTH1002CT | TO-220AB | 2.23 g | 50 | Tube |
| STTH1002CG | STTH1002CG | D ² PAK | 1.48 g | 50 | Tube |
| STTH1002CG-TR | STTH1002CG | D ² PAK | 1.48g | 1000 | Tape & reel |
| STTH1002CR | STTH1002CR | I ² PAK | 1.49 g | 50 | Tube |
| STTH1002CFP | STTH1002CFP | TO-220FPAB | 1.70 g | 50 | Tube |

PACKAGE MECHANICAL DATA DPAK



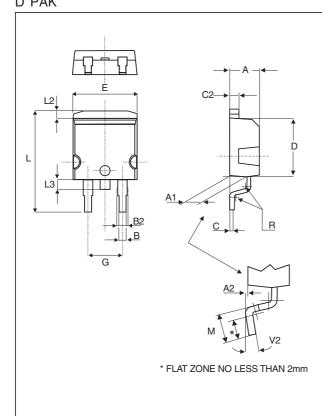
| | DIMENSIONS | | | | |
|------|------------|----------------|-------|--------|--|
| REF. | Millin | imeters Inches | | hes | |
| | Min. | Max | Min. | Max. | |
| Α | 2.20 | 2.40 | 0.086 | 0.094 | |
| A1 | 0.90 | 1.10 | 0.035 | 0.043 | |
| A2 | 0.03 | 0.23 | 0.001 | 0.009 | |
| В | 0.64 | 0.90 | 0.025 | 0.035 | |
| B2 | 5.20 | 5.40 | 0.204 | 0.212 | |
| С | 0.45 | 0.60 | 0.017 | 0.023 | |
| C2 | 0.48 | 0.60 | 0.018 | 0.023 | |
| D | 6.00 | 6.20 | 0.236 | 0.244 | |
| Е | 6.40 | 6.60 | 0.251 | 0.259 | |
| G | 4.40 | 4.60 | 0.173 | 0.181 | |
| Н | 9.35 | 10.10 | 0.368 | 0.397 | |
| L2 | 0.80 | 0.80 typ. | | 1 typ. | |
| L4 | 0.60 | 1.00 | 0.023 | 0.039 | |
| V2 | 0° | 8° | 0° | 8° | |

FOOTPRINT



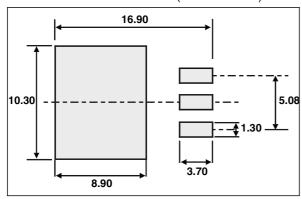
/ 5/8

$\begin{array}{c} \textbf{PACKAGE MECHANICAL DATA} \\ \textbf{D}^2 \textbf{PAK} \end{array}$



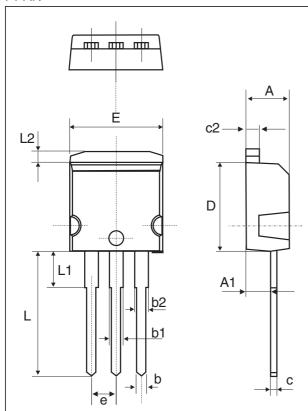
| | DIMENSIONS | | | | |
|------|------------|--------|------------|-------|--|
| REF. | Millin | neters | Inches | | |
| | Min. | Max. | Min. | Max. | |
| Α | 4.40 | 4.60 | 0.173 | 0.181 | |
| A1 | 2.49 | 2.69 | 0.098 | 0.106 | |
| A2 | 0.03 | 0.23 | 0.001 | 0.009 | |
| В | 0.70 | 0.93 | 0.027 | 0.037 | |
| B2 | 1.14 | 1.70 | 0.045 | 0.067 | |
| С | 0.45 | 0.60 | 0.017 | 0.024 | |
| C2 | 1.23 | 1.36 | 0.048 | 0.054 | |
| D | 8.95 | 9.35 | 0.352 | 0.368 | |
| Е | 10.00 | 10.40 | 0.393 | 0.409 | |
| G | 4.88 | 5.28 | 0.192 | 0.208 | |
| L | 15.00 | 15.85 | 0.590 | 0.624 | |
| L2 | 1.27 | 1.40 | 0.050 | 0.055 | |
| L3 | 1.40 | 1.75 | 0.055 | 0.069 | |
| М | 2.40 | 3.20 | 0.094 | 0.126 | |
| R | 0.40 typ. | | 0.016 typ. | | |
| V2 | 0° | 8° | 0° | 8° | |

FOOTPRINT DIMENSIONS (in millimeters)



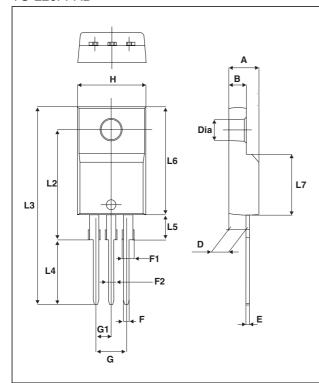
6/8

PACKAGE MECHANICAL DATA I²PAK



| | DIMENSIONS | | | | |
|------|-------------|------|-------|-------|--|
| REF. | Millimeters | | Inc | hes | |
| | Min. | Max. | Min. | Max. | |
| Α | 4.40 | 4.60 | 0.173 | 0.181 | |
| A1 | 2.49 | 2.69 | 0.098 | 0.106 | |
| b | 0.70 | 0.93 | 0.028 | 0.037 | |
| b1 | 1.14 | 1.17 | 0.044 | 0.046 | |
| b2 | 1.14 | 1.17 | 0.044 | 0.046 | |
| С | 0.45 | 0.60 | 0.018 | 0.024 | |
| c2 | 1.23 | 1.36 | 0.048 | 0.054 | |
| D | 8.95 | 9.35 | 0.352 | 0.368 | |
| е | 2.40 | 2.70 | 0.094 | 0.106 | |
| E | 10.0 | 10.4 | 0.394 | 0.409 | |
| L | 13.1 | 13.6 | 0.516 | 0.535 | |
| L1 | 3.48 | 3.78 | 0.137 | 0.149 | |
| L2 | 1.27 | 1.40 | 0.050 | 0.055 | |

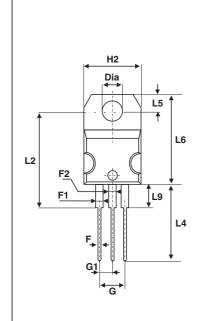
PACKAGE MECHANICAL DATA TO-220FPAB

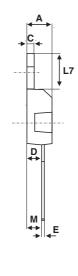


| | DIMENSIONS | | | | |
|------|------------|--------|-------|-------|--|
| REF. | Millim | neters | Inc | hes | |
| | Min. | Max. | Min. | Max. | |
| Α | 4.4 | 4.6 | 0.173 | 0.181 | |
| В | 2.5 | 2.7 | 0.098 | 0.106 | |
| D | 2.5 | 2.75 | 0.098 | 0.108 | |
| E | 0.45 | 0.70 | 0.018 | 0.027 | |
| F | 0.75 | 1 | 0.030 | 0.039 | |
| F1 | 1.15 | 1.70 | 0.045 | 0.067 | |
| F2 | 1.15 | 1.70 | 0.045 | 0.067 | |
| G | 4.95 | 5.20 | 0.195 | 0.205 | |
| G1 | 2.4 | 2.7 | 0.094 | 0.106 | |
| Н | 10 | 10.4 | 0.393 | 0.409 | |
| L2 | 16 Typ. | | 0.63 | Тур. | |
| L3 | 28.6 | 30.6 | 1.126 | 1.205 | |
| L4 | 9.8 | 10.6 | 0.386 | 0.417 | |
| L5 | 2.9 | 3.6 | 0.114 | 0.142 | |
| L6 | 15.9 | 16.4 | 0.626 | 0.646 | |
| L7 | 9.00 | 9.30 | 0.354 | 0.366 | |
| Dia. | 3.00 | 3.20 | 0.118 | 0.126 | |

PACKAGE MECHANICAL DATA

TO-220AB





| | DIMENSIONS | | | | |
|-------|------------|--------|------------|--------|--|
| REF. | Millin | neters | ers Inches | | |
| | Min. | Max. | Min. | Max. | |
| Α | 4.40 | 4.60 | 0.173 | 0.181 | |
| С | 1.23 | 1.32 | 0.048 | 0.051 | |
| D | 2.40 | 2.72 | 0.094 | 0.107 | |
| Е | 0.49 | 0.70 | 0.019 | 0.027 | |
| F | 0.61 | 0.88 | 0.024 | 0.034 | |
| F1 | 1.14 | 1.70 | 0.044 | 0.066 | |
| F2 | 1.14 | 1.70 | 0.044 | 0.066 | |
| G | 4.95 | 5.15 | 0.194 | 0.202 | |
| G1 | 2.40 | 2.70 | 0.094 | 0.106 | |
| H2 | 10 | 10.40 | 0.393 | 0.409 | |
| L2 | 16.4 typ. | | 0.64 | 5 typ. | |
| L4 | 13 | 14 | 0.511 | 0.551 | |
| L5 | 2.65 | 2.95 | 0.104 | 0.116 | |
| L6 | 15.25 | 15.75 | 0.600 | 0.620 | |
| L7 | 6.20 | 6.60 | 0.244 | 0.259 | |
| L9 | 3.50 | 3.93 | 0.137 | 0.154 | |
| М | 2.6 typ. | | 0.102 typ. | | |
| Diam. | 3.75 | 3.85 | 0.147 | 0.151 | |

- Epoxy meets UL94,V0
- Cooling method: by conduction (method C)
- Recommended torque value (TO-220AB): 0.8 N.m.
- Maximum torque value (TO-220AB): 1.0 N.m.
- Recommended torque value (TO-220FPAB): 0.55 N.m.
- Maximum torque value (TO-220FPAB): 0.7 N.m.

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics.

All other names are the property of their respective owners.

© 2004 STMicroelectronics - All rights reserved.

STMicroelectronics GROUP OF COMPANIES

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States

www.st.com

57